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(71)(72) Applicant and Inventor: SUNDHOLM, Göran [FI/FI]; Ilmari Kiannon kuja 3, FIN-04310 Tuusula (FI).

(74) Agent: VALROS, Frey; Marioff Ky, P.O. Box 25, FIN-01511 Vantaa (FI).

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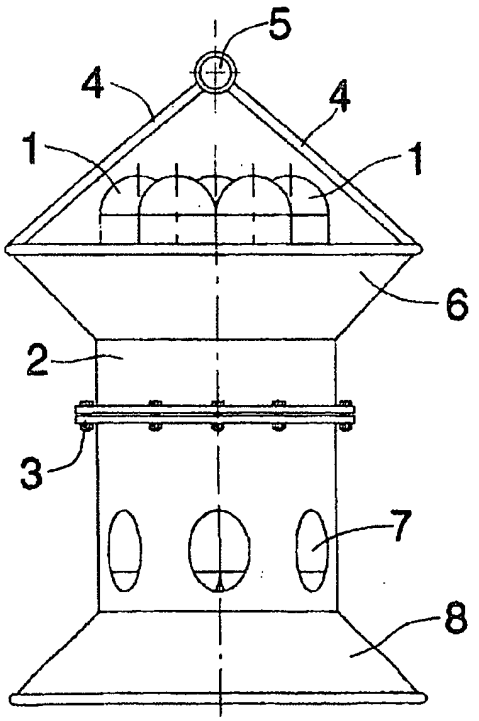
(54) Title: METHOD AND EQUIPMENT FOR FIGHTING FIRE

(57) Abstract

The object of the invention is to provide a new method and new equipment for fighting fires, in particular outdoor fires difficult to extinguish, such as forest fires and oil fires. This is achieved in that, by means of a preferably mobile construction, a set of hydraulic accumulators (1) provided with outlet nozzles (9) capable of utilizing a high drive pressure, producing, by suction effect, a fog-like penetrating liquid spray, is brought to action range from a fire and thereafter the hydraulic accumulators are emptied into the fire.



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Method and equipment for fighting fire

The present invention relates to a method and equipment for fighting fires, in particular outdoor fires difficult to extinguish, such as forest fires and oil fires.

Forest fires and oil fires, as well as many other types of fires, are often either so difficultly accessible or generate already in the beginning, when the fire could be extinguished by a prompt action, such a strong heat that an early fighting of the fire remains undone.

The object of the invention is to provide a new method and new equipment to more efficiently than hereto fight such difficultly extinguishable fires.

The method of the invention is mainly characterized in that, by means of a preferably mobile construction, a set of hydraulic accumulators provided with outlet nozzles capable of, utilizing a high drive pressure, producing, by suction effect, a fog-like penetrating liquid spray, is brought to action range from a fire and thereafter the hydraulic accumulators are emptied into the fire.

According to a preferable mode of the method, the set of hydraulic accumulators is lowered from a helicopter to action range, the air stream generated by the main rotor of the helicopter preferably being utilized for intensifying the penetration power and the effect of the extinguishing liquid.

The equipment according to the invention is mainly characterized in that it comprises a set of hydraulic accumulators movable by means of a suspension structure to action range from a fire and provided with outlet nozzles capable of, utilizing a high drive pressure, producing, by suction effect, a fog-like penetrating liquid spray.

The set of hydraulic accumulators is preferably held together by an enveloping jacket structure preferably provided with jacket openings and/or a collecting air intake at the closed end of the hydraulic accumulators opposite to the nozzle heads.

By means of the invention e.g. distant forest fires can be quickly and efficiently fought, which has not been possible hereto.

The invention shall in the following be described in more detail with reference to a preferred exemplifying embodiment of the equipment according to the invention, shown in the attached drawing.

Figure 1 shows the equipment according to the invention, directed downwards.

Figure 2 shows the equipment directed to the side.

Figure 3 shows a partial longitudinal section of the equipment of figure 1.

Figure 4 shows the equipment of figure 1 seen from above.

The equipment shown in the drawing comprises a set or a battery of hydraulic accumulators 1, in the example according to the drawing seven accumulators, which are held together by an enveloping jacket structure 2 which in the drawing is made of two parts joined together by means of a flange joint 3. The accumulators 1 can have an initial charge pressure of up to about 280 bar, although lower pressures also are possible, and can for the rest either be of conventional structure with a so-called gas bladder or membrane, or possibly be made in principle as has been presented in the patent application 931405, so that they at first deliver liquid only and in a later stage, when the drive pressure of the accumulators has fallen, a mixture of liquid and drive gas.

The equipment is intended to by means of stays 4

and a lift loop 5 be able to be lifted and lowered as needed from e.g. a helicopter or a crane.

The upper part of the jacket structure 2 in figure 1 has a funnel-like part 6 widening upwards, preferably more or less conically, and the lower part of the jacket structure preferably has a number of jacket openings 7 near the outlet nozzle heads of the hydraulic accumulators 1, and a funnel-like part 8.

The outlet nozzle heads of the hydraulic accumulators 1, which also can be called spray heads, are visible in figure 3 and are designated 9. The spray heads 9 are preferably made as presented in the international patent application PCT/FI92/0155, with a number of obliquely downwards and outwards directed nozzles adapted mutually with respect to, among other things, droplet size and accumulator drive pressure, that they, producing a suction, deliver fog-like, proportionally concentrated liquid sprays, which effectively are capable of penetrating fire seats.

The hydraulic accumulators 1 are carried by a support plate 10 visible in figure 3 and preferably fixed in the lower part of the jacket structure 2 and comprising a number of openings 11 visible in figure 4. Mutually between the hydraulic accumulators 1, as well as between the hydraulic accumulators 1 and the jacket structure 2, run air passages which are designated 12 and are visible likewise in figure 4. Reference numeral 13 in figure 13 indicates a band element which under the influence of the flange joint 3 presses the hydraulic accumulators in abutment against each other.

The equipment according to the invention can, preferably from a helicopter, be lowered to a suitable height above a fire seat and can be released by means of remote controlled means, known per se and not shown in the drawing. The nozzle heads 9 of the hydraulic

accumulators produce a forceful suction, whereby necessary additional air is sucked in partly through the jacket openings 7 and partly via the channels 12 running along the set of accumulators and out past the nozzle heads 9 through the openings 11 of the plate 10. In particular through the jacket openings 7 will also smoke gases be sucked in, which is of advantage in that also these gases have an extinguishing effect.

As a fire can be attacked from above, which is the case e.g. for forest fires, and the equipment thus is in vertical position according to figures 1, 3 and 4, the air stream produced by the main rotor of the helicopter, which air stream is partly collected by the funnel-like part 6, boosts the penetration and the general effect of the extinguishing liquid.

If it for some reason is not suitable to attack a fire from above, the equipment can be turned obliquely to the side, as shown in figure 3, possibly sideways altogether. Such fires can be oil fires e.g. on oil drilling rigs, or possibly fires in high buildings. At least in certain such cases a crane or the like can be used instead of a helicopter.

Especially in such cases, when the equipment is turned sideways but it still is of advantage to carry out the maneuvres of the equipment from a helicopter, the air stream produced by the rotor of the helicopter can be utilized by means of a bent-up funnel-like part 14 at the closed end of the long bottle-like hydraulic accumulators 1, as is shown in figure 3. In the embodiment of figure 3 there are no jacket openings 7 on the upper side of the jacket structure.

Claims:

1. A method for fighting fires, in particular outdoor fires difficult to extinguish, such as forest fires and oil fires, characterized in that, by means of a preferably mobile construction, a set of hydraulic accumulators (1) provided with outlet nozzles (9) capable of, utilizing a high drive pressure, producing, by suction effect, a fog-like penetrating liquid spray, is brought to action range from a fire and thereafter the hydraulic accumulators are emptied into the fire.

2. A method according to claim 1, characterized in that the set of hydraulic accumulators is lowered from a helicopter to action range.

3. A method according to claim 2, characterized in that the air stream generated by the main rotor of the helicopter is utilized for intensifying the penetration power and the effect of the extinguishing liquid.

4. Equipment for fighting fires, in particular outdoor fires difficult to extinguish, such as forest fires and oil fires, characterized in that it comprises a set of hydraulic accumulators (1) movable by means of a suspension structure (4,5) to action range from a fire and provided with outlet nozzles (9) capable of, utilizing a high drive pressure, producing, by suction effect, a fog-like penetrating liquid spray.

5. Equipment according to claim 4, characterized in that the set of hydraulic accumulators (1) is held together by an enveloping jacket structure (2) in such a way that mutually between the hydraulic accumulators (1), and preferably likewise between the hydraulic accumulators and the jacket structure, are formed longitudinal air channels (12).

6. Equipment according to claim 5, characterized in that the set of hydraulic accumulators (1) is carried by a plate (10) fixed in the jacket structure (2) and provided with openings (11).

7. Equipment according to claim 5, characterized in that the jacket structure (2) comprises a preferably generally conical air collecting means (6, 14) at its end away from the nozzle heads (9) of the hydraulic accumulators (1).

8. Equipment according to claim 5 or claim 7, characterized in that the jacket structure comprises jacket openings (7), preferably near the nozzle heads (9) of the hydraulic accumulators (1).

9. Equipment according to claim 5, characterized in that the jacket structur (2) is made in two parts joined by means of a flange joint (3) arranged to by tightening clamp a band element (13) around the set of hydraulic accumulators (1).

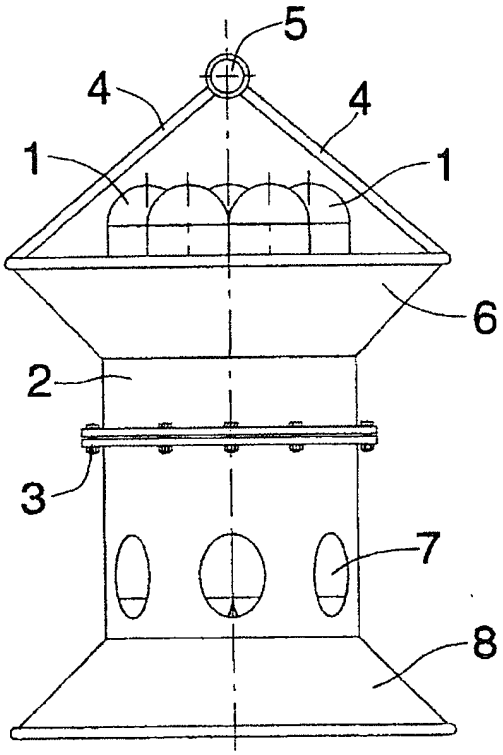

Fig. 1

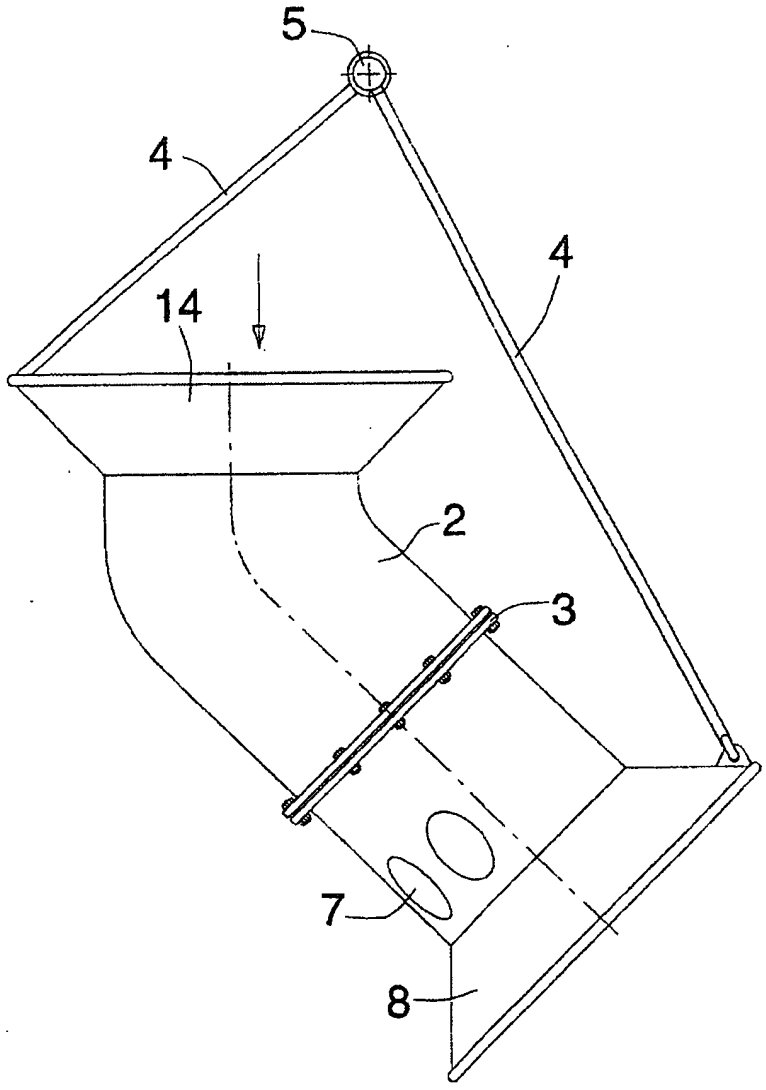

Fig. 2

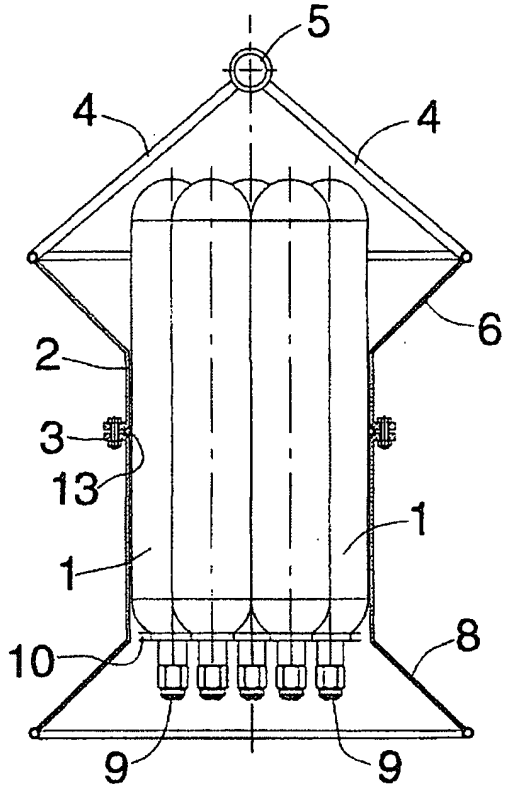

Fig. 3

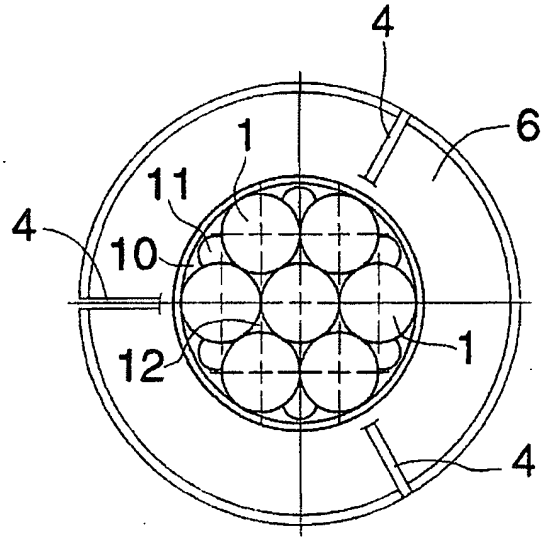

Fig. 4

INTERNATIONAL SEARCH REPORT

International application No.
PCT/FI 94/00172

A. CLASSIFICATION OF SUBJECT MATTER

IPC5: A62C 3/02, B64D 1/16
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC5: A62C, B64D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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DIALOG

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE, C2, 2909737 (MESSERSCHMITT-BÖLKOW-BLOHM GMBH), 18 Sept 1980 (18.09.80) --	1,2
A	US, A, 2250762 (J.F. HABERLIN), 29 July 1941 (29.07.41) --	1,2
P,A	WO, A1, 9310859 (SUNDHOLM, GÖRAN), 10 June 1993 (10.06.93) --	1
A	Derwent's abstract, No 81-J4581D/37, week 8137, ABSTRACT OF SU, 1225585 (FEUER WSCHGERA NEURUPPIN (KWIA)), 23 April 1986 (23.04.86) --	1

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US, A, 4881601 (SMITH), 21 November 1989 (21.11.89) --	2
A	US, A, 4601345 (MAHRT), 22 July 1986 (22.07.86) --	2
A	US, A, 3710868 (CHADWICK), 16 January 1973 (16.01.73) --	2
A	WO, A1, 8706479 (PIPETEK OY), 5 November 1987 (05.11.87) --	2

INTERNATIONAL SEARCH REPORT

Information on patent family members

02/07/94

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PCT/FI 94/00172

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE-C2- 2909737	18/09/80	NONE	
US-A- 2250762	29/07/41	NONE	
WO-A1- 9310859	10/06/93	AU-A- 2946792	28/06/93
		FI-D- 942386	00/00/00
		FI-A- 924752	21/04/94
		WO-A- 9408659	28/04/94
US-A- 4881601	21/11/89	EP-A- 0412209	13/02/91
US-A- 4601345	22/07/86	NONE	
US-A- 3710868	16/01/73	NONE	
WO-A1- 8706479	05/11/87	AU-A- 7351687	24/11/87